



UNIVERSITI PUTRA MALAYSIA

**ANTHRACNOSE FRUIT ROT OF CHILLI (CAPSICUM ANNUM L.):
SOME ASPECTS OF ITS ETIOLOGY, EPIDEMIOLOGY AND
CONTROL IN PENINSULAR MALAYSIA**

MAH SHOOK YING

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SOME ASPECTS OF ITS ETIOLOGY, EPIDEMIOLOGY
AND CONTROL IN PENINSULAR MALAYSIA

by

MAH SHOOK YING

A thesis submitted in partial fulfilment of the
requirements for the degree of Master of Agricultural Science
in the Faculty of Agriculture, Universiti Pertanian Malaysia

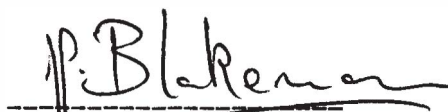
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TABLE OF CONTENTS

	PAGE
ACKNOWLEDGEMENTS	iii
TABLE OF CONTENTS	v
LIST OF TABLES	ix
LIST OF FIGURES	xi
LIST OF ABBREVIATIONS	xiv
ABSTRACT	xv
CHAPTER 1 – INTRODUCTION	
1.1 The chilli plant	1
1.2 Chilli cultivation in Peninsular Malaysia	3
1.3 Anthracnose of chilli	7
1.4 Objectives of present study	8
CHAPTER 2 – LITERATURE REVIEW	
2.1 The genus <u>Colletotrichum</u>	11
2.2 Anthracnose disease of chilli	12
2.3 <u>Colletotrichum capsici</u> – host range and pathogenicity	13
2.4 Control of anthracnose	15
CHAPTER 3 – ETIOLOGICAL INVESTIGATIONS	
3.1 Introduction	18



	PAGE
3.2 Materials and methods	19
3.2.1 Survey and collection of disease samples	19
3.2.2 Isolation of the pathogen	22
3.2.3 Cultural characteristics of the isolates ^s	23
3.2.4 Germination of conidia on chilli agar	24
3.2.5 Effect of environmental factors on growth of <u>C. capsici</u>	25
a) Hydrogen-ion concentration	25
b) Temperature	26
3.2.6 Development of rapid in vitro inoculation technique for evaluating resistance of chilli fruits to <u>C. capsici</u>	26
a) Spraying detached chilli fruits with spore suspension	27
b) Dip inoculation of mechanically injured fruits	29
c) Dip inoculation of uninjured fruits	29
d) Injection of fruits with hypodermic needle	29
e) Pin prick method	31
f) Fungal plug method	31
3.2.7 Interaction between varieties, growth stages of chilli and incidence of anthracnose disease	33

	PAGE
3.3 Results	35
3.3.1 Collection and isolation of <u>C. capsici</u> isolates	35
3.3.2 Cultural characteristics of the isolates	41
3.3.3 Germination of conidia on chilli agar	44
3.3.4 Effect of environmental factors on growth of <u>C. capsici</u>	50
a) Hydrogen-ion concentration	50
b) Temperature	50
3.3.5 Development of rapid in vitro inoculation technique for evaluating resistance of chilli fruits to <u>C. capsici</u> infection	52
3.3.6 Interaction between varieties, growth stages of chilli and incidence of anthracnose disease	56
3.4 Discussion	63
CHAPTER 4 – EPIDEMIOLOGICAL ASPECTS	
4.1 Seed transmission	71
4.1.1 Introduction	71
4.1.2 Materials and methods	72
4.1.3 Results and discussion	73
4.2 Disease spread	80
4.2.1 Introduction.....	80
4.2.2 Materials and methods	82



	PAGE
4.2.3 Results	83
4.2.4 Discussion	87
CHAPTER 5 – CHEMICAL CONTROL	
5.1 Introduction	89
5.2 Materials and methods	90
5.2.1 In vitro screening of fungicides	90
5.2.2 Field screening of fungicides	93
5.3 Results	94
5.3.1 In vitro screening	94
5.3.2 Field screening	100
5.4 Discussion	105
CHAPTER 6 – GENERAL DISCUSSION	109
REFERENCES	114
APPENDICES	123



LIST OF TABLES

TABLE		Page
I	Average nutritive value (ANV) of sweet and hot peppers (chillies), per 100 grams edible product	4
II	Total net import and production of chillies in Peninsular Malaysia, 1967-1981	6
III	<u>Colletotrichum capsici</u> isolates: origin and locations in Peninsular Malaysia	24
IV	Cultural and morphological characteristics of <u>C. capsici</u> isolates obtained from various localities in Peninsular Malaysia	45
V	Growth and development pattern of germ tubes of conidia of <u>C. capsici</u> on solidified chilli agar medium (CA)	48
VI	Linear growth of <u>C. capsici</u> in culture under a range of hydrogen-ion concentrations. Five replicates were used at each pH value	51
VII	The effect of temperature on the linear growth of five <u>C. capsici</u> isolates	52
VIII	The effect of variety and host growth stage on the incidence of anthracnose caused by <u>C. capsici</u> on chilli fruits - 1st Experiment	58
IX	Analysis of variance of <u>C. capsici</u> infection on 5 different varieties of chilli inoculated at 5 stages of growth	59
X	The effect of variety and host growth stage on the incidence of anthracnose caused by <u>C. capsici</u> on chilli fruits - 2nd Experiment	60



TABLE		PAGE
XI	Mean percentage infection of 6 different varieties of chilli fruits by <u>C. capsici</u>	61
XII	Effect of <u>C. capsici</u> on emergence, survival and growth of chilli, <u>Capsicum annum</u>	75
XIII	Inhibition of mycelial growth of <u>C. capsici</u> at various concentrations of fungicides	92
XIV	Effectiveness of different fungicides against mycelial growth of <u>C. capsici</u>	95
XV	Effect of fungicides on yield and incidence of anthracnose fruit rot on chilli (Trial I)	101
XVI	Effect of fungicides on yield and incidence of anthracnose fruit rot on chilli (Trial II)	102
XVII	Effect of fungicides on yield and incidence of anthracnose fruit rot on chilli (Trial III)	103
XVIII	Effect of fungicides on yield and incidence of anthracnose fruit rot on chilli (Trial IV)	104

LIST OF FIGURES

FIGURE		PAGE
1	Map of Peninsular Malaysia showing localities where samples were collected	20
2	Map showing the average monthly rainfall distribution for selected stations in Peninsular Malaysia	21
3	Potato dextrose agar blocks for determining viability of <u>Colletotrichum capsici</u> spores	28
4	Incubation of inoculated chilli fruits in moist chamber	30
5	Inoculating chilli fruit with conidia of <u>Colletotrichum capsici</u> by the pin-prick method	32
6	Greenhouse experiment to study the influence of growth stage and varieties of chilli on severity of anthracnose fruit rot disease	34
7	Chilli fruit showing typical anthracnose lesion. Black acervuli are arranged in concentric rings giving the lesion a target-board appearance	36
8	Acervulus of <u>Colletotrichum capsici</u> developed on PDA, showing stroma and hyaline, non-septate conidia. Note the absence of setae	38
9	Five-day old cultures of <u>Colletotrichum capsici</u> (isolate IMI 256699) on potato dextrose agar	39
10	Ten-day old colony of <u>Colletotrichum capsici</u> cultured on PDA showing presence and distribution of acervuli	42



FIGURE		PAGE
11	Changes in cultural characteristics of <u>Colletotrichum capsici</u> isolate with repeated sub-culturing on PDA. Note white, appressed mycelial mat and lack of acervuli development on 10-day old culture	43
12	A. Conidia of <u>C. capsici</u> B. Germ tube development 4 hours after plating on chilli agar medium C. Germ tube development 22 hours after plating on chilli agar medium	47
13	Percentage germination of <u>C. capsici</u> conidia 4, 8, 16 and 22 hours after plating on chilli agar medium	49
14	The effect of temperature on five isolates of <u>C. capsici</u> - colony diameter on PDA after 7 days of incubation in darkness	53
15	Percentage infection of 5 varieties of chilli fruits when inoculated at 5 different growth stages with <u>C. capsici</u>	57
16	Percentage infection of 6 varieties of chilli fruits when inoculated at 5 different growth stages with <u>C. capsici</u>	62
17	<u>C. capsici</u> infection on cotyledon, cotyledonary leaves and hypocotyl of chilli seedlings	74
18	Germination response of non-infected chilli seeds and infected chilli seeds (with <u>C. capsici</u>) over time	76

FIGURE		PAGE
19	Survival of seedlings from non-infected chilli seeds and infected chilli seeds (with <u>C. capsici</u>) over a period of 45 days	77
20	Response of chilli seedlings from non-infected and <u>C.capsici</u> -infected seeds in terms of increase in height over a period of 45 days	78
21	Spread of anthracnose fruit rot in a chilli plot	84
22	Relationship between rainfall and anthracnose disease incidence in a chilli crop	86
23	Inhibition of mycelial growth of <u>C. capsici</u> at different concentrations of Maneb, Dichlofluanid, Benomyl and Bitertanol	96
24	Inhibition of mycelial growth of <u>C. capsici</u> at different concentrations of Propineb, Carbendazim and Chlorothalonil	97
25	Inhibition of mycelial growth of <u>C. capsici</u> at different concentrations of Maneb + Fentin acetate	98
26	Inhibition of mycelial growth of <u>C.capsici</u> at different concentrations of Mancozeb, Anilazine and Maneb + Zineb + Ferbam	99

LIST OF ABBREVIATIONS

g	gram
hr	hour
ml	millilitre
mg	milligram
mm	millimetre
pH	hydrogen ion exponent
μ	micrometre
MT	metric ton
CWT	hundredweight
%	percent
kcal	kilo calories
kg	kilogram
ha	hectare
ppm	parts per million
PDA	potato dextrose agar
CA	chilli agar
°C	degree (s) Celsius
viz,	namely
ft	foot; feet
in	inch(es)
m	metre
Mo	Molybdenum
Mn	Manganese
Zn	Zinc
Fe	Ferrum, iron



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MAH SHOOK YING

March 1987

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Anthracnose fruit rot is a serious limiting factor in the production and yield of fresh chillies (Capsicum annuum L.) in Peninsular Malaysia. Isolates obtained from diseased chilli fruits collected in various localities in the country yielded the fungus, Colletotrichum capsici (Syd.) Butler & Bisby.

Pathogenicity studies on mature chilli fruits confirmed that C. capsici could produce typical elliptical or oblong straw-coloured lesions on the fruit surface with subsequent development of black acervuli in concentric rings. Comparison of isolates on potato dextrose agar showed that all the isolates were relatively similar in cultural and morphological



characteristics. Germination of conidia occurred 3 - 4 hours after plating on chilli agar medium. Branching of germ tubes occurred between 16-24 hours after germination. The fungus grew over a wide range of hydrogen-ion concentrations (between pH 3.0 and pH 10.0) with optimum between pH 7.0 and pH 9.5. Acervuli formation and development was more evident on alkaline medium than on acidic medium. Optimum temperature for mycelial growth was between 25 °C and 32 °C. The minimum and maximum temperatures for visible growth were 10 °C and 45 °C, respectively.

Studies on several inoculation methods under laboratory conditions showed that dipping non-blemished chilli fruits into a spore suspension of 1×10^6 spores/ml, followed by incubation in a moist chamber gave good lesion development. This method was therefore adopted as a rapid in-vitro inoculation technique for mass screening tests. Screening of local and introduced varieties of chilli at various growth stages indicated differential resistance of chilli varieties to C. capsici, although growth stage had little influence on the incidence of anthracnose ripe rot disease.

Studies also showed that chilli seeds infected with C. capsici had a higher percentage of germination than non-infected seeds though subsequent seedling growth was retarded. The spread of the disease in the field was greatly influenced



by the direction of prevailing winds, indicating the importance of wind-borne spores to disease spread. Rainfall influenced disease depending on the amount, duration, intensity and pattern of rainfall during a crop cycle.

In-vitro screening of fungicides indicated that Brestan 10 (maneb + fentin acetate) was highly inhibitory to the growth of the fungus. However, field evaluation of 14 test fungicides indicated that none of the chemicals tested was very effective in controlling anthracnose ripe rot disease of chilli due to various limitations.

Abstrak tesis yang dikemukakan kepada Senat Universiti
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syarat keperluan ijazah Master Sains Pertanian

PENYAKIT ANTHRAXNOS BUAH CILI (CAPSICUM ANNUUM L.):
BEBERAPA ASPEK ETIOLOGI, EPIDEMIOLOGI SERTA
PENGAWALAN DI SEMENANJUNG MALAYSIA

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Mac 1987

Penyelia : Professor George Varghese, Ph. D.
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Fakulti : Pertanian

Penyakit bintik berpusar adalah satu faktor pembatasan yang serius dalam produksi dan penghasilan cili-cili segar (Capsicum annuum L.) di Semenanjung Malaysia. Buah-buah cili berpenyakit yang diambil dari beberapa tempat dalam negara, dan telah diasingkan, mengandungi kulat, Colletotrichum capsici (Syd.) Butler & Bisby.

Kajian-kajian patogenisiti ke atas buah-buah cili yang masak mengesahkan bahawa C. capsici boleh menyebabkan lesion-lesion berbentuk bulat - panjang atau bujur yang biasa, berwarna jerami, di permukaan buah, diikuti oleh tumbuhan acervulus hitam berbentuk bulat. Perbandingan terhadap

dektros kentang (PDA) yang telah diasingkan menunjukkan semuanya adalah seakan-akan bersifat terpelihara dan morfologi. Percambahan conidia berlaku 3-4 jam selepas saduran ke atas agar cili. "Germ tubes" atau tiub germa merebak di antara 16-24 jam selepas percambahan. Kulat-kulat tumbuh dalam lingkungan kepekatan hydrogen ion yang luas (di antara pH 3 dan pH 10) dengan optima di antara pH 7 dan pH 9.5. Pembentukan dan perkembangan acervulus lebih nyata pada penimbal alkali dibandingkan dengan penimbal asid. Suhu optima untuk pertumbuhan kulat adalah di antara 25 °C dan 32 °C. Suhu minima pertumbuhan nyata ialah 10 °C dan maksimumnya 45 °C.

Kajian-kajian ke atas beberapa kaedah suntikan di makmal menunjukkan bahawa mencelup buah-buah cili yang tidak cedera ke dalam ampaian spora dengan kepekatan air 1×10^6 spora/ml, diikuti dengan kaedah pengeraman dalam tempat lembab menghasilkan calar-calar yang baik. Cara ini telah dipilih sebagai kaedah suntikan in vitro yang sesuai untuk ujian-ujian penyiasatan berkumpul. Siasatan terhadap cili-cili tempatan dan jenis-jenis yang dicadangkan pada peringkat-peringkat pertumbuhan tertentu, menunjukkan beberapa penahanan yang berlainan pada C. capsici, walaupun di peringkat pertumbuhan, kecil pengaruhnya terhadap berlakunya penyakit anthracnose.

Kajian-kajian menunjukkan juga bahawa biji-biji cili yang dijangkiti C. capsici mempunyai peratus percambahan yang lebih

tinggi daripada biji-biji yang tidak dijangkiti, walaupun pertumbuhan anak-anak pokok yang seterusnya tergendat. Arah tiupan angin telah mempengaruhi penyebaran penyakit ini di ladang menunjukkan pentingnya spora yang dibawa angin dalam merebakkan penyakit. Hujan boleh mempengaruhi penyakit, bergantung kepada kekerapan, lama, lebat dan pola-pola hujan semasa sesuatu giliran tanaman.

Siasatan in vitro terhadap racun kulat menunjukkan bahawa Brestan 10 (maneb + fentin acetate) adalah peka besar ke atas pertumbuhan kulat itu. Walau bagaimanapun penyaringan di ladang terhadap 14 racun kulat yang diuji, menunjukkan bahawa tiada bahan kimia yang didapati paling berkesan untuk mengawal penyakit anthraknos cili, disebabkan terdapatnya beberapa pembatasan.

CHAPTER 1

INTRODUCTION

1.1 The chilli plant

Capsicum annuum L., commonly known as capsicum, chilli or chilli pepper, includes a large number of horticultural varieties and is by far the most economically important of all the cultivated species of Capsicum. It belongs to the family Solanaceae and is a native of Central and South America (Purseglove, 1968; Ware and McCollum, 1975; Thompson and Kelly, 1978; Anon., 1983). Under cultivation, the chilli plant is an annual although several cultivars may be perennials in warmer climates. Flowers are small, white, 5-partite and borne singly on the axils of leaves. Different cultivars have berries or pods or seed-vessels that vary in shape and size. When ripe, the colour of the berries ranges from blood-red to yellow, orange, dark violet to even green or black. Seeds are white or straw-coloured, flat and kidney-shaped and are attached to a fleshy placenta. Pungency is due to a non-volatile compound called capsaicin, the vanillyl amide of isodecylanic acid (Burkhill, 1935; Purseglove, 1968; Anon., 1983). The amount of capsaicin is controlled by a single dominant gene and varies enormously in various cultivars. Matthew et al. (1971) reported that generally the amount of capsaicin in chilli

ranges from 0.1 percent to 1 percent, while the Indian variety has capsaicin content in the range of 0.2 percent to 0.5 percent.

Domestic and wild species of Capsicum were found in the New World as early as prehistoric times. Columbus carried the seed to Spain in 1493 (Thompson and Kelly, 1978) and from there, it was introduced to Europe and Asia. Purseglove (1968) and Heiser (1976) reported that by 1542 there were already three races of Capsicum being cultivated in India. In 1931 Ochse, Bakhuizen and van den Brink reported that C. annuum was "cultivated everywhere in the Dutch East Indies for its pungent fruits". C. annuum can be grown from sea-level to 6,000 feet or more. At present in Java, chilli is planted between rice-crops and in Malaysia it is cultivated as a garden crop or on small farms. In India, chilli is widely grown in areas around Madras and in the plains of upper India. During the period from 1969 - 1971, the world production of fresh capsicum was given as 5,027,000 metric tons(MT) per year and production increased to 7,055,000 MT per year during the period from 1979 - 1981 (FAO, 1982). India is now the biggest producer and exporter of chillies with annual exports exceeding 200,000 cwt. (9,072 MT) per year in some years, followed by Thailand with about 100,000 cwt (4,536 MT) per year (Purseglove, 1968). Purseglove (1968) also reported that Sri Lanka imports the largest quantities of chillies, followed by the United States and Malaysia.

